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Apparatus for Study of Plasmas at Elevated Temperatures

A special apparatus has been developed to make possible a study of the reactions of high concentrations of dissociated gases on objects maintained at elevated temperatures. In the apparatus, microwave discharge plasmas take place within a heated zone, and it is possible to make measurements of the change in weight of specimens in the plasma; additionally, the temperature of the sample and the plasma can be obtained, thus facilitating determinations of reaction rates and recombination coefficients.

The essential feature of the apparatus is a furnace within the discharge tube so that efficient heat transfer can take place to the sample. The furnace heating element is made of a grooved refractory core with a bifilar winding of resistance wire; an outer radiation shield acts as an insulator. The upper end of the furnace is hollow, and a small central hole in the furnace base serves as a gas inlet. The furnace is supported on three insulator tubes that carry electrical leads, and it is enclosed within a 50-mm quartz tube connected to a vacuum system. Gases are dissociated in the microwave field produced in the resonance cavity appropriately formed around the quartz tube; the plasma can be caused to form in the sample region within the furnace, or the cavity can be moved directly below the furnace so that gases are dissociated before reaching the sample.

A solid sample can be suspended within the open end of the furnace and attached to a balance; as dissociated gas passes over the sample, measurements of weight change can be made for the determination of reaction rates and interactions of the dissociated gas with the solid sample. For the determination of the concentration of dissociated species, the gas flowing into the furnace can be titrated by a gas flowing through a jet sealed in the quartz tube; the jet may be placed, as desired, inside the furnace near the sample or above the furnace.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Ames Research Center
Moffett Field, California 94035
Reference: TSP 75-10285

Patent status:

NASA has decided not to apply for a patent.

Source: Jerry D. Christian
and William P. Gilbreath
Ames Research Center
(ARC-10958)

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